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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,848	11/25/2002	Evangelos Laskaris	040849-0194	9715

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General Electric Company (PCPI)
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EXAMINER

FETZNER, TIFFANY A

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 07/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/065,848

Applicant(s)

LASKARIS ET AL.

Examiner

Tiffany A Fetzner

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on May 20th 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11/25/2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. 07/13/2004.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED 2nd non-final ACTION

Response to Arguments

1. Applicant's arguments with respect to **claims 1-22** have been considered but are moot in view of the new ground(s) of rejection. The earlier art rejections are **rescinded**.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1-5, 7-12, 14-23** are rejected under **35 U.S.C. 102(b)** as being anticipated by **Danby** US patent 6,201,394 B1 published March 13th 2001, filed November 21st 1997.
4. With respect to **Claim 1**, **Danby** teaches and shows "An open magnetic resonance imaging (MRI) device" [See figures 1-15, col. 1 lines 66-67; col. 3 lines 3-58] **Danby** teaches and shows, that the device comprises "at least one main coil" (i.e. electromagnetic coils 48, 50 of figure 1) "for generating a magnetic field for imaging a volume" [See col. 6 lines 40-67; , col. 12 lines 16-51; , col. 3 line 3 through col. 4 line 63.] **Danby** also teaches and shows "at least one shaping coil", (i.e. component 755 taught in col. 15 lines 42-57, or the shimming coil components 43 of figure 2; col. 6 lines 53-60) "being positioned relative to said at least one main coil" [See figure 2] (i.e. electromagnetic coils 48, 50 of figures 1, 2; col. 5 line 46 through col. 6 line 67) "to shape said magnetic field in said volume". [See col. 15 lines 42-57, figures 1-15]

5. With respect to **Claim 2, Danby** teaches and shows "a single unit support structure" [See Figures 8, 2] "wherein said at least one main coil" (i.e. component 248, or 250, of figure 8; or component 48, 50 of figure 2) "is positioned on an outer surface of said single unit support structure", (i.e. within the apparent floor or ceiling of the frame but outside of poles 230, and 232 of figure 8 or 30 and 32 of figure 2) {See figure 8} "and wherein said at least one shaping coil" (i.e. the shim coil element 43) "is positioned on an inner surface of said single unit support structure". {See figure 2}. The same reasons for rejection, that apply to **claim 1** also apply to **claim 2** and need not be reiterated.

6. With respect to **Claim 3, Danby** teaches and shows that "said single unit support structure comprises: a substantially cylindrical shell;" [See figure 12 col. 15 line 58 through col. 16 line 5]] "a hub positioned along a substantially central axis of said cylindrical shell" [See figures 15, 12, 7, and 6]. **Danby** also shows a plurality of gussets" (i.e. component 28 of figure 1; col. 5 lines 63-65) "positioned within said cylindrical shell" [See figure 2 in combination with figure 12, since figure 2 shows a rectangular configuration and figure 12 shows the cylindrical variation] "each of said gussets" (i.e. component 28) "extending radially outward from said hub" [See figure 2]. The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 3** and need not be reiterated.

7. With respect to **Claim 4, Danby** shows that "at least one support post positioned between a first half and a second half of said cylindrical shell." {See figures 12, 14, and

15]. The same reasons for rejection, that apply to **claims 1, 2, 3** also apply to **claim 4** and need not be reiterated.

8. With respect to **Claim 5, Danby** shows that "at least one support post is attached on one end to a flange formed on the first half of said cylindrical shell and attached on an opposite end to a flange formed on the second half of said cylindrical shell". {See figures 14, and 15; col. 2 lines 23-59}. The same reasons for rejection, that apply to **claims 1, 2, 3, 4** also apply to **claim 5** and need not be reiterated.

9. With respect to **Claim 7, Danby** teaches "at least one ferromagnetic ring positioned on an outer surface of said single unit support structure." {See col. 18 lines 65-67} The same reasons for rejection, that apply to **claims 1, 2** also apply to **claim 7** and need not be reiterated.

10. With respect to **Claim 8, Danby** teaches and shows "at least one ferromagnetic ring" (i.e. a ferromagnetic edge ring col. 18 lines 65-67) "is positioned" [See figure 2 component 43] "substantially between coils having opposite current directions" [See col. 4 lines 24-43; col. 6 lines 53-60]. The same reasons for rejection, that apply to **claims 1, 2, 7** also apply to **claim 8** and need not be reiterated.

11. With respect to **Claim 9, the Danby** reference directly shows from figure 2 that "said MRI device comprises at least four ferromagnetic rings", because each shim coil element 43 includes a ferromagnetic edge ring, [See col. 18 lines 65-67] and figure 2 shows at least 4 shim coil elements 43. The same reasons for rejection, that apply to **claims 1, 2, 7** also apply to **claim 9** and need not be reiterated.

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12. With respect to **Claim 10**, the **Danby** reference directly suggests at least one bucking coil" [See col. 13 lines 38-59; col. 14 lines 18-24; col. 4 lines 33-43], "positioned on an outer surface of said single unit support structure for shielding the magnetic field." [See col. 13 lines 38-59; col. 14 lines 18-24; col. 4 lines 33-43; figures 8, 7 components 256, 294]. The same reasons for rejection, that apply to **claims 1, 2**, also apply to **claim 10** and need not be reiterated.

13. With respect to **Claim 11**, the **Danby** reference directly suggests "at least two bucking coils". [See figures 8, 7; and col. 13 lines 38-59; col. 14 lines 18-24; and col. 4 lines 33-43, because more than one bucking coil is taught]. The same reasons for rejection, that apply to **claims 1, 2, 10** also apply to **claim 11** and need not be reiterated.

14. With respect to **Claim 12**, **Danby** shows via figures 2, that there are "at least eight shaping coils" [See figure 2 component 43, See also the teaching of the plurality of auxiliary coils 755 which shape the magnetic flux as well, col. 15 line 42 through col. 16 line 5.] The same reasons for rejection, that apply to **claim 1**, also apply to **claim 12** and need not be reiterated.

15. With respect to **Claim 14**, the **Danby** reference shows from figure 2 shim shaping coil component 43, "an even number of shaping coils" [See figure 2]. The same reasons for rejection, that apply to **claim 1**, also apply to **claim 14** and need not be reiterated.

16. With respect to **Claim 15**, the **Danby** reference shows from figure 2 and the teaching of col. 4 lines 24-43; with col. 3 lines 3-20, that "a first half of the number of

shaping coils have a first magnetic polarity and a second half of the number of shaping coils have a second magnetic polarity substantially opposite that of said first magnetic polarity". The same reasons for rejection, that apply to **claims 1, 14**, also apply to **claim 15** and need not be reiterated.

17. With respect to **Claim 16**, the **Danby** reference shows from figure 2 "a plurality of shaping coils", (i.e. shimming components 43 are interpreted by the examiner as a type of shaping coil, half are above and half are below the gap) the **Danby** reference teaches "at least one of said plurality of shaping coils having a magnetic polarity opposite to a magnetic polarity of another of said plurality of shaping coils." [See col. 4 lines 24-43, col. 6 lines 53-60; and the detailed rejections of **claims 7, 14, and 15**]. The same reasons for rejection, that apply to **claims 1, 2, 7, 14, 15** also apply to **claim 16** and need not be reiterated.

18. With respect to **Claim 17**, the **Danby** reference shows from figure 2, and figure 7 a "main coil", (i.e. components 48, 50 of figure 2, components 248, 250 of figure 7) "bucking coil" (i.e. components 254, 256, 294 of figures 7, 8) and "shaping coil" (i.e. shimming coil elements 43 of figure 2, col. 6 lines 53-60; or the auxiliary coils 755 of col. 15 lines 42-44.) More specifically, the **Danby** reference teaches, "A magnetic resonance imaging (MRI) apparatus for imaging a volume, comprising : at least one main coil configured to generate a magnetic field", (i.e. components 48, 50 of figure 2, components 248, 250 of figure 7) "at least one bucking coil" (i.e. components 254, 256, 294 of figures 7, 8) "configured to shield said at least one main coil;" [See col. 13 line 38 through col. 14 line 24; col. 4 lines 24-43] "a plurality of shaping coils to shape said

magnetic field in said volume" (i.e. shimming coil elements 43 of figure 2, col. 6 lines 53-60; or the auxiliary coils 755 of col. 15 lines 42-44; col. 4 lines 24-43.) "and a plurality of ferromagnetic rings" [See col. 18 lines 65-67 in combination with figure 2, col. 6 lines 53-60; and col. 4 lines 24-43] "for shielding interactions between coils of opposite polarity, at least one of said plurality of ferromagnetic rings being positioned between said at least one main coil and said at least one bucking coil" {See the rejections of **claims 1, 7, 10, 11, 14, 15, 16**; Figures 1 through 15}. The same reasons for rejection, that apply to **claims 1, 2, 7, 10, 14, 15, 16** also apply to **claim 17** and need not be reiterated.

19. With respect to **Claim 18**, **Danby** reference shows "a single unit support structure" {See figures 1-15} "for supporting said at least one main coil, (i.e. components 48, 50 of figure 2, components 248, 250 of figure 7) "said at least one bucking coil" (i.e. components 254, 256, 294 of figures 7, 8) "said plurality of shaping coils", (i.e. shimming coil elements 43 of figure 2, col. 6 lines 53-60; or the auxiliary coils 755 of col. 15 lines 42-44; col. 4 lines 24-43.) "and said plurality of ferromagnetic rings" [See col. 18 lines 65-67 in combination with figure 2, col. 6 lines 53-60; and col. 4 lines 24-43] The same reasons for rejection, that apply to **claims 1, 2, 7, 10, 14, 15, 16, 17** also apply to **claim 18** and need not be reiterated.

20. With respect to **Claim 19**, the **Danby** reference shows and teaches from the **earlier rejections of claims 1, 2, 3**, which need not be reiterated that "said single unit support structure comprises: a substantially cylindrical shell; a hub positioned along a substantially central axis of said cylindrical shell", and a plurality of gussets positioned

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within said cylindrical shell, each of said gussets extending radially outward from said hub.” {See figures 1-15; col. 3 line 3 through col. 18 line 67} The same reasons for rejection, that apply to **claims 1, 2, 3, 7, 10, 14, 15, 16, 17, 18** also apply to **claim 19** and need not be reiterated.

21. With respect to **Amended Claim 20, Danby** teaches and shows "A magnetic resonance imaging (MRI) apparatus for imaging a volume", [See figures 1-15] "comprising: means for generating a magnetic field for imaging said volume" [See upper magnetic pole 30, lower ferromagnetic pole 32, and electromagnetic coils 48, 50 of figure 1 col. 5 line 46 through col. 6 line 67]; **Danby** also teaches and shows a "means for shielding said means for generating" [See blocking plates 306 of Figure 9, col. 14 lines 25-64]; "and means for shaping said magnetic field positioned radially inside the said means for producing the magnetic field." [i.e. shimming coils 43, col. 6 lines 53-60, as shown in figure 2 are positioned radially inside the main magnetic poles]

22. With respect to **Claim 21, Danby** teaches and shows in figures 1-15, a "means for supporting" (i.e. the pole supports 20 and 22 of figures 1, 2, 4) "said means for generating" [See upper magnetic pole 30, lower ferromagnetic pole 32, and electromagnetic coils 48, 50 of figures 1, 2 col. 5 line 46 through col. 6 line 67]) "said means for shielding" [See blocking plates 306 of Figure 9, col. 14 lines 25-64]; "and said means for shaping". [i.e. the shimming coils 43, taught in col. 6 lines 53-60, and shown in figure 2] The same reasons for rejection, that apply to **claim 20** also apply to **claim 21** and need not be reiterated.

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23. With respect to **Claim 22**, **Danby** teaches and shows a "means for shielding interactions between coils of opposite polarity." [See col. 4 lines 24-43, col. 13 line 38 through col. 14 line-64]. The same reasons for rejection, that apply to **claim 20** also apply to **claim 22** and need not be reiterated.

24. With respect to **Claim 23**, **Danby** teaches and shows "An open magnetic resonance imaging (MRI) device" [See figures 1-15, col. 1 lines 66-67; col. 3 lines 3-58] **Danby** teaches and shows, that the device comprises "at least one main coil" (i.e. electromagnetic coils 48, 50 of figure 1) "for generating a magnetic field for imaging a volume" [See col. 6 lines 40-67; col. 12 lines 16-51; col. 3 line 3 through col. 4 line 63.] **Danby** also teaches and shows "at least one shaping coil", (i.e. shimming coil component 43 taught in col. 6 lines 53-60;) "said at least one shaping coil being positioned radially within the said at least one main coil" [See figure 2] "to shape said magnetic field in said volume". [See col. 6 lines 53-60; and the additional coils component 755 of col. 15 lines 42 through col. 16 line 5, figures 2, 11].

Claim Rejections - 35 USC § 103

25. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

26. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

27. **Claims 6, 13** are rejected under **35 U.S.C. 103(a)** as being unpatentable over

Danby US patent 6,201,394 B1 published March 13th 2001, filed November 21st 1997.

28. With respect to **Claim 6**, **Danby** lacks directly teaching that "at least one of: said cylindrical shell, said hub, and said gussets comprise one of stainless steel, aluminum, and fiber-reinforced composites." However, **Danby** does teach that steel slabs comprise pole supports 20 and 22, [See col. 5 lines 46-65 and figure 4] The examiner notes that figure 12 is the cylindrical variation of figure 4 therefore **Danby** teaches that "at least one of: said cylindrical shell, said hub, and said gussets comprises steel". **Danby** lacks directly teaching that the steel is stainless steel, however it would have been obvious to one of ordinary skill in the art at the time that the invention was made that, because stainless steel is a type of steel, and the use of steel, is taught that the **Danby** reference broadly comprises stainless steel within its scope. Additionally, because stainless steel is known to be a substance which does not rust or oxidize over time, It would have been obvious to one of ordinary skill in the art at the time that the invention was made to modify the teaching of **Danby** to use stainless steel in the construction of the apparatus because the main goal of an MRI apparatus is to produce a strong magnetic field that is as uniformly homogeneous as possible, and the use of a non-rusting steel, is known to eliminate a potential source of magnetic field variation over time. Therefore, It would have been obvious to one of ordinary skill in the art at the time that the invention was

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made that the use of stainless steel is highly desirable because it intrinsically helps to maintain magnetic field uniformity. The same reasons for rejection, that apply to **claims 1, 2, 3** also apply to **claim 6** and need not be reiterated.

29. With respect to **Claim 13**, the **Danby** reference lacks directly teaching that "said at least one shaping coil shapes said magnetic field in said volume to a uniformity of at least 10 ppm." However, the **Danby** invention produces a uniform magnetic field from 0.5 kilogauss (i.e. 500 Gauss) up to 22 kilogauss (i.e. 22,000 Gauss) across its vertical extent, with all of the components interacting. The uniform imaging volume has a 17.5 inch to 36 inch; or almost 1.45 feet to 3 feet vertical extent, therefore it would have been obvious to one of ordinary skill in the art at the time that the invention was made that upon performing the conversion to account for the ppm parts per million scale, that the **Danby** reference does suggest a uniformity of at least 10 ppm. [See col. 11 lines 38-63; and col. 6 lines 33-39] The same reasons for rejection, that apply to **claim 1**, also apply to **claim 13** and need not be reiterated.

30. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) Cheng et al., US Patent Application publication 2003/0001575 A1 published January 2nd 2003, filed January 19th 2001.

B) Cheng et al., PCT international publication WO 01/53847 A1 published 26 July 2001, filed January 19th 2001.

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Conclusion

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.



TAF
July 14, 2004



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800